

Aug. 18, 1931.

J. C. STOKES

1,819,798

COLLAPSIBLE BIT

Filed April 25, 1927

2 Sheets-Sheet 1

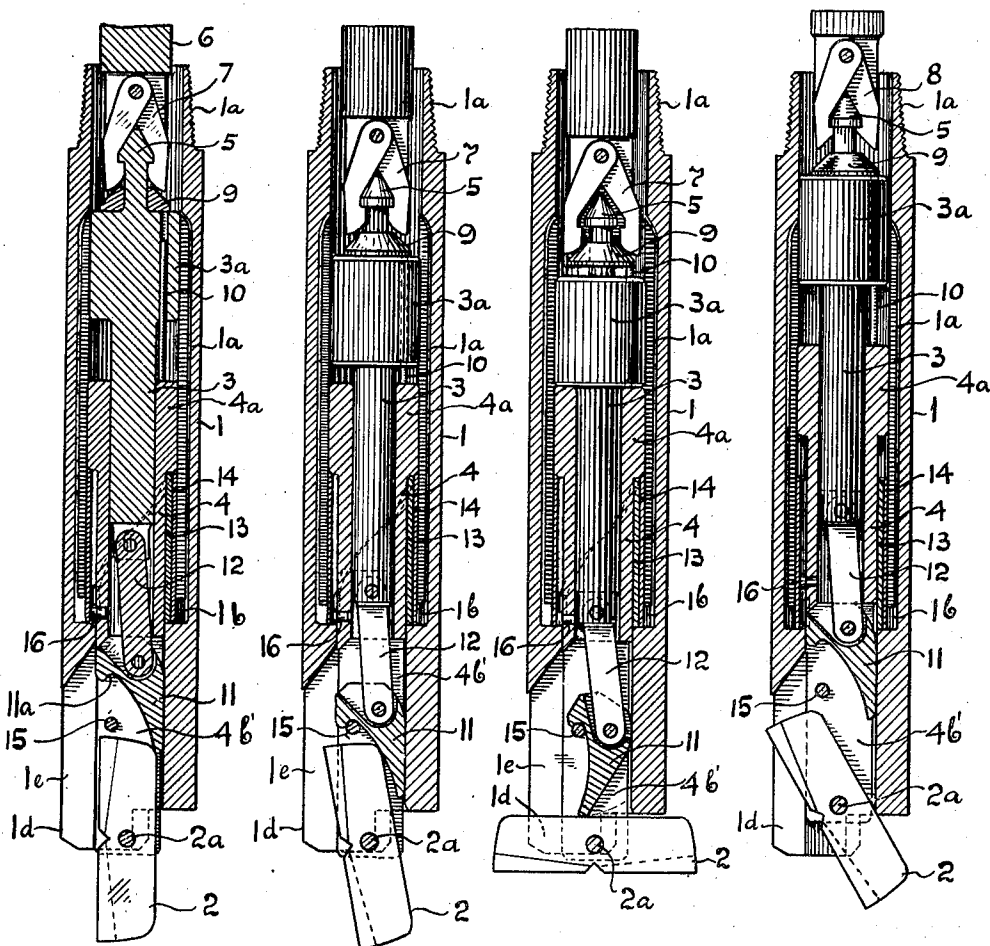


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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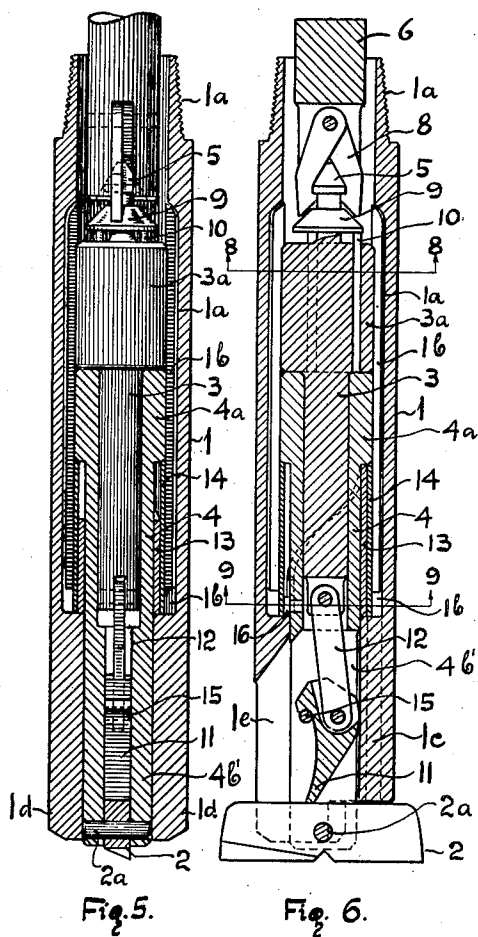
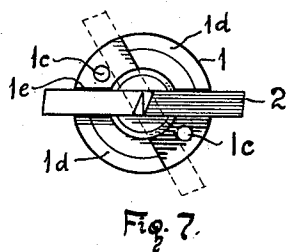
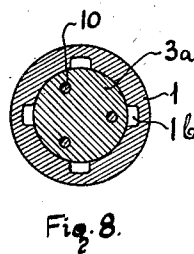
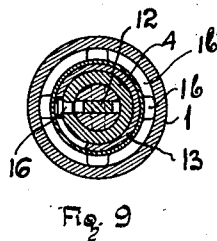
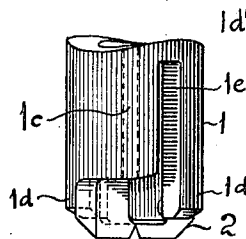
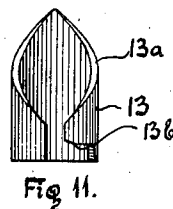
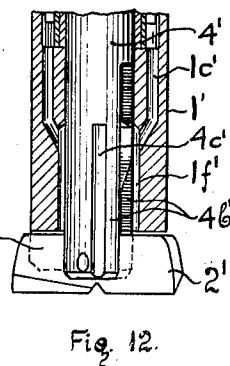
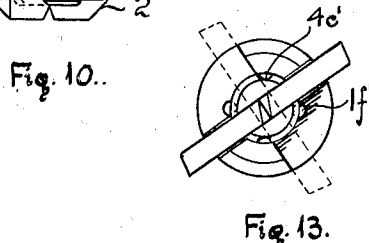
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2 Sheets-Sheet 2



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COLLAPSIBLE BIT

Application filed April 25, 1927. Serial No. 186,473.

This invention relates to deep well drilling apparatus and more particularly to collapsible bits of the type disclosed in my Letters Patent of the United States No. 1,360,328 of November 30, 1920; No. 1,379,483 of May 24, 1921; No. 1,442,188 of January 16, 1923; No. 1,448,818 of March 20, 1923; No. 1,451,794 of April 17, 1923; and No. 1,511,640 of October 14, 1924—the present invention constituting an improvement of the devices covered by said Letters Patent.

The invention has for its general object the provision of an improved collapsible bit embodying elements few in number, strongly constructed and combined, of efficient operation, and capable of being cheaply and easily manufactured.

More specifically, it is the object of the invention to provide a new and improved collapsible bit having a cutting blade, and to provide new and improved means to alternately move said blade into its operative and inoperative positions.

Another object of the invention is to provide new and improved means to indicate the relative position of the cutting blade with respect to the bit head.

Various other objects will be apparent in the following description and the accompanying drawings which are illustrative of the preferred embodiment of the invention.

Fig. 1 is a sectional side elevation of the assembled bit showing the elements thereof so positioned that the blade is in its lowermost vertical position.

Fig. 2 is a partly sectional side elevation similar to Fig. 1, the elements having been so moved that the blade has assumed an inclined position.

Fig. 3 is a view similar to Fig. 2, the blade, however, having been disposed in its horizontal, or operative, position.

Fig. 4 is a view similar to Fig. 2, the short dogs having replaced the long dogs illustrated in Figs. 1, 2 and 3, and removal of the bit carrier out of the bit head having been commenced.

Fig. 5 is a partly sectional side elevation of the assembled bit taken at right angles to

Figs. 1, 2, 3 and 4; illustrating the elements with the blade in operative position.

Fig. 6 is a sectional side elevation of the assembled bit taken at right angles to Fig. 5.

Fig. 7 is a bottom plan view of the assembled bit with the blade in operative position.

Fig. 8 is a transverse sectional view on the line 8—8 of Fig. 6.

Fig. 9 is a transverse sectional view on the line 9—9 of Fig. 6.

Fig. 10 is a fragmentary detail side view of the lower end of the bit head with the blade in operative position, and is illustrative of the slot in the side of the bit head through which the blade swings.

Fig. 11 is a detail of the sleeve guide.

Fig. 12 is a fragmentary and partly sectional side elevation of the lower end of the bit, provided with cooperative water courses in the bit head and in the depending spaced legs of the blade carrier.

Fig. 13 is a bottom plan view of the construction illustrated in Fig. 12.

Referring more specifically to the drawings, the bit head is indicated at 1, and has an upper reduced screw-threaded end 1a adapted to be screwed into the usual pipe, not shown. Head 1 has a longitudinal bore extending therethrough. Water courses in the form of longitudinal grooves 1b and an annular groove 1b' at the base of grooves 1b are cut in the wall of said bore intermediate the ends of the bit head. Referring to Figs. 6, 7 and 10, these grooves communicate with bores 1c. Slush passes through these grooves into bores 1c, the disposition of bores 1c being such that the slush will be discharged from the bottom of the head directly in front of the cutting edges of blade 2. The slush courses shown in Figs. 12 and 13 differ from those disclosed in the other figures, and will hereinafter be described.

A pair of oppositely disposed downwardly projecting lugs 1d are formed integral with the bottom of head 1 to provide shoulders for the positive support of cutting blade 2 when the bit is in operation; and a longitudinal slot 1e is cut in said head immediately adjacent one of lugs 1d, to permit the swinging

of blade 2 into and out of the bore of the head when rotated on its pivot.

It may be noted that blade 2 has a notch in the middle of the cutting edge thereof and oppositely beveled teeth extending outwardly from said notch, as shown.

The bit carrier, which is slidably movable into and out of the bore of head 1, comprises generally a plunger 3 and a sleeve 4. Plunger 3 has an enlarged upper end 3a provided with a stem having a conical head 5. Upon said stem is slidably mounted a frusto-conical weight 9.

A lowering and hoisting device or "overshot" 6 which is attached to a wire line, not shown, carries long dogs 7 (Fig. 1) and short dogs 8 (Fig. 4). This overshot per se does not constitute a part of the present invention, the same having been included in the patents hereinabove identified.

Enlarged portion 3a of plunger 3 has adjacent the periphery thereof three longitudinal bores to slidably receive rods 10, said rods engaging the upper surface of enlarged portion 4a of sleeve 4. There is accordingly effected a movement of rods 10 in the bores of enlarged portion 3a of plunger 3 when plunger 3 moves with respect to sleeve 4. The base of weight 9 rests upon the upper end of enlarged portion 3a and over the bores therein. When the plunger 3 and sleeve 4 move downwardly, downward movement of sleeve 4 is arrested, and the rods 10 are projected above portion 3a to hold weight 9, and the long dogs 7 come in contact with weight 9 and are thereby forced out of engagement with conical head 5. This occurs when blade 2 has assumed its lowermost position. There still remains sufficient space between the weight 9 and conical head 5 for the reception of the teeth of short dogs 8, the long dogs 7 being used to lower the bit carrier into the bit head and the short dogs 8 being used to remove the same therefrom.

The lower end of sleeve 4 is diametrically slotted to form a fork 4b, in which blade 2 is pivoted as shown at 2a. The lower end of plunger 3 is bifurcated and a link 12 is pivoted thereto, as shown. Finger 11 has a rounded recess in the upper end thereof in which link 12 is pivoted.

One side of finger 11 is made concave and has a notch 11a (Fig. 1) cut therein. A pin 15 is secured in fork 4b at one side of the longitudinal axis thereof. When finger 11 is lowered, pin 15 engages in notch 11a and swings finger 11 from the position illustrated in Fig. 2 to that illustrated in Fig. 3, thereby causing said finger to ride the back of blade 2 and swing said blade on its pivot from the position shown in Fig. 1, so that the opposite ends thereof will emerge from fork 4b, the upper end of said blade swinging downwardly and outwardly through slot 1e

of bit head 1, to assume the position illustrated in Fig. 3.

When the bit head is rotated in the hole, blade 2 will tend to remain stationary, due to the friction between the same and the bottom of the hole, and shoulders or lugs 1d will come into contact therewith to effect revolution thereof with the head and to strongly support the same.

A guide 13, of which Fig. 11 is a detail view, has a beveled upper end 13a, and a lower notched end 13b, with an opening between the two, as shown. The bore of head 1 is reduced at its lower end, and an internal annular flange is thereby formed upon which guide 13 is secured. A tubular shield 14 may be placed around said guide to prevent interference with the function thereof by slush forced downwardly through grooves 1b, said shield extending from said flange to enlarged portion 4a of plunger 4 when the latter is in its lowermost position. Sleeve 4 carries a pilot pin 16, said pin being guided by the beveled upper surface of guide 13. The uppermost point of guide 13 is disposed on that side of the axis of the bit head opposite to the side wherein is cut slot 1e. It will be obvious that when sleeve 4 is lowered, the pilot pin 16 carried thereby will ride downwardly on the beveled upper surface of guide 13, and sleeve 4 will be revolved until pin 16 reaches the lowermost part of said surface and drops through the opening in said guide. The disposition of the pin on the sleeve and the guide on the head, is such that when said pin reaches the opening in said guide, the blade 2 will be opposite slot 1e and can then be swung therethrough. Thus the guide and pilot pin serve to so position blade 2 that it can be moved into operative position. When the bit head is rotated, and moves with respect to blade 2, as hereinabove described, pilot pin 16 will be moved into notch 13b in an obvious manner.

The use and operation of the device as illustrated in Figs. 1 to 10, inclusive, will perhaps be understood from the foregoing, but may be outlined as follows.

When the long dogs 7 of the overshot 6 have been made to engage the conical head 5 the bit carrier is lowered through the pipe, not shown, into the bit head 1, by means of the usual wire line, not shown. Finger 11 has a flat upper end and a beveled upper corner which engage the bottom of sleeve 4, as shown in Fig. 1. It will be observed that when the bit carrier has been lowered to the position shown in Fig. 1, the enlarged portion 4a of sleeve 4 has come to rest on the upper ends of shield 14 and guide 13, and further downward movement thereof has thereby been arrested, the cooperation of guide 13 and pilot pin 16 having theretofore guided said sleeve into the position shown.

Plunger 3, however, continues its downward movement, assuming the position shown in Fig. 2. When the finger 11, connected to plunger 3 by pivoted link 12, reaches the position shown in Fig. 2, pin 15 enters the notch 11a therein. When the plunger 3 continues its downward movement to assume its ultimate position, illustrated in Fig. 3, pin 15 causes finger 11 to swing and move the upper end of blade 2 outwardly through slot 1e, so that the longitudinal axis of blade 2 will be disposed at right angles to the longitudinal axis of the head. Meanwhile rods 10 have prevented weight 9 from following plunger 3. Conical head 5 was thereby released from the clutches of long dogs 7. The overshoot is then free to be removed.

When the bit head is rotated, shoulders or lugs 1d move into engagement with blade 2, and pilot pin 16 moves into notch 13b. The bit may then be used, slush being pumped down through the pipe, not shown, through grooves 1b, 1b' and out through bore 1c immediately in front of the cutting edges of blade 2.

When blade 2 becomes dull, or for any other reason the removal of the same is desired, the overshoot with short dogs 8 thereon is lowered in the pipe, not shown, and made to engage conical head 5. The head is then rotated in the reverse direction so that slot 1e will be opposite blade 2. Plunger 3 is then pulled upwardly, (Fig. 4), and finger 11 comes into contact with sleeve 4 and raises the same, and blade 2 moving upwardly strikes the bottom of head 1 and is swung into its vertical position.

The construction illustrated in Figs. 12 and 13 provides means whereby the position of the blade with respect to the slot in the head will be indicated when the bit is down in the hole.

Referring to Fig. 12 and 13, the bit head is indicated at 1'. Bores 1c' in said head converge inwardly and discharge slush into grooves 1f'. Cooperating grooves 4c' are formed in the outer surfaces of forks 4b', the grooves 1f' and grooves 4c' being brought alternately into and out of alinement when sleeve 4' is rotated in head 1'. Grooves 4c' and 1f' are so arranged that when the one is opposite the other, the blade 2' is in its operative position against shoulders 1d'. The resistance to the passage of slush therethrough is, accordingly, the resistance offered by a circular bore of a radius equal to the depth of said grooves.

When the blade 2' is to be removed, the bit head is rotated in the opposite direction. Such rotation should effect the movement of the slot in the head to a position immediately above blade 2', the groove 1f' having meanwhile been moved out of alinement with the groove 4c'. The parts after the

movement has been completed are illustrated in Fig. 13. The slush course has by such movement been reduced, and this reduction will necessarily be attended by more resistance to the passage of slush through the bit, which will require greater pump pressure, and the pump above, (not shown) will indicate the change in resistance. If the blade should become stuck, and accordingly not move from its operative position, the signal will not be given by the pump and no attempt should be made to withdraw the blade, until movement thereof to a position below the slot in the head has been effected.

By the means described the driller will be notified when the blade has assumed either its operative or inoperative positions.

The many advantages and uses of the invention will be apparent to those skilled in the art, and a discussion thereof is here unnecessary.

Any suitable cutting device may be substituted for the sole blade shown.

The invention is not limited to the specific embodiment illustrated and described, and various changes may be made without departure from the scope of the following claims.

I claim:

1. In a drill, a head, a blade carrier slidable in said head, a blade movably mounted on said carrier, a plunger slidable in said head and movable with respect to said carrier, a link carried by said plunger, and a finger carried by said link and engaging said blade to move the latter.

2. In a drill, a head, a blade carrier slidable in said head, a blade movably mounted on said carrier, a plunger slidable in said head and movable with respect to said carrier, a blade actuating finger pivoted to said plunger, said finger having a notch on one side thereof, and a pin on said carrier to enter said notch and swing said finger.

3. In a drill, a head, a sleeve slidable in said head, a plunger slidable in said sleeve and having a bore therein, dogs adapted to engage said plunger, and a rod in said bore and actuated by said sleeve to disengage said plunger and said dogs.

4. In a drill, a head, a sleeve slidable in said head, a plunger slidable in said sleeve and having an enlarged portion with a bore therein, dogs adapted to engage said plunger, and a rod in said bore and actuated by said sleeve to disengage said plunger and said dogs.

5. In a drill, a head having a slot therein, a carrier slidable in said head, a pilot pin carried by said carrier, a guide in said head for said pilot pin comprising a tubular body having a beveled upper end, and a blade mounted on said carrier and movable through said slot, said guide being so disposed on the head and said pin on the car-

rier that the blade will be positioned opposite said slot.

6. In a drill, a head having a water course, a blade carrier movable in said head and having a water course, the water course in said carrier being so arranged that the passage of water therethrough is alternately permitted and prevented by movement of the carrier with respect to the head.

7. In a drill, a head having a bore and a groove in the wall of said bore, a blade carrier movable in said bore and having a groove therein, said grooves being adapted when one is positioned opposite the other to form a water course.

8. In a drill, a head having a bore and a water groove in the wall of said bore, a blade carrier movable in said bore and having a groove therein, and a blade on said carrier, said grooves being so arranged that the groove in the head will be opposite the groove in the carrier to form a water course when the blade is in its operative position.

9. In a drill, a head having a bore, a slot, and a water groove in the wall of said bore, a blade carrier movable in said bore and having a groove therein, and a blade on said carrier, said grooves being so arranged that they are out of alinement when the blade is opposite the slot in the head.

10. In a drill, a head having a bore and a water groove in the wall of said bore, a blade carrier movable in said bore and having a water groove therein, and a blade on said carrier, said grooves being so arranged that they are in alinement when the blade is in its operative position and out of alinement when the blade is in its inoperative position.

11. In a drill, a head, a blade carrier movable in said head, a blade on said carrier, and means to permit the free passage of water through said drill when the blade is in its operative position, and to limit the passage of water through said drill when the blade is not in its operative position.

12. In a drill, a head having a slot therein, a carrier slidable in said head, a blade mounted on said carrier and movable through said slot, a sleeve guide disposed in said head to so guide said carrier that said blade will be positioned opposite said slot, and a tubular shield in said head around said guide.

13. In a drill, a head having a slot therein, a carrier slidable in said head, a blade mounted on said carrier and movable through said slot, a pilot pin carried by said carrier, and a pilot pin guide in said head to so guide said carrier that said blade will be positioned opposite said slot, said guide comprising a tubular body having a beveled upper end, a notched lower end, and an opening therebetween.

14. In a drill, a head, a blade carrier slidable in said head, a blade movably mounted on said carrier, said blade being of a length

greater than the width of said head, a plunger slidable in said head and movable with respect to said carrier, a link carried by said plunger, and a finger carried by said link and engaging said blade to move said blade from a substantially vertical to a substantially horizontal position.

15. In a drill, a head having a bore and a slot in one side thereof, a blade carrier slidable in said bore, a blade pivoted to said carrier, the length of said blade being greater than the width of said head, a plunger slidable in said head and movable with respect to said carrier, a link carried by said plunger, and a finger carried by said link and engaging said blade to rotate said blade through said slot.

In testimony whereof, I hereunto affix my signature.

JOHN C. STOKES.